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The effects of increased stream temperatures on juvenile steelhead growth in the Yakima River Basin based on projected climate change scenarios

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Abstract Stakeholders within the Yakima River Basin expressed concern over impacts of climate change on mid Columbia River steelhead (*Oncorhynchus mykiss*), listed under the Endangered Species Act. We used a bioenergetics model to assess the impacts of changing stream temperatures resulting from different climate change scenarios on growth of juvenile steelhead in the Yakima River Basin. We used diet and fish size data from fieldwork in a bioenergetics model and integrated baseline and projected stream temperatures from down scaled air temperature climate modeling into our analysis. The stream temperature models predicted that daily mean temperatures of salmonid rearing streams in the basin could increase by 1 2 °C and our bioenergetics simulations indicated that such increases could enhance the growth of steelhead in the spring, but reduce it during the summer. However, differences in growth rates of fish living under different climate change scenarios were minor, ranging from about 1 5 %. Because our analysis focused mostly on the growth responses of steelhead to changes in stream temperatures, further work is needed to fully understand the potential impacts of climate change. Studies should include evaluating changing stream flows on fish activity and energy budgets, responses of aquatic insects to climate change, and integration of bioenergetics, population dynamics, and habitat responses to climate change.

J. M. Hardiman and M. G. Mesa assume equal senior authorship.

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